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National Wood In Transportation Program

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Status Report

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The National Wood In Transportation Program

Northeastern Area
State and Private Forestry

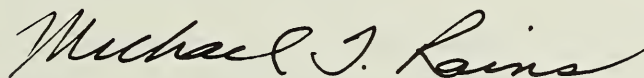
February 1999

FOREWARD

Modern timber bridges combine today's technology with a renewable American resource. Advances in wood preservation and the design of wooden structures make the modern timber bridge an economical, safe, and attractive alternative to other materials for bridge construction in many situations. To date, the Wood In Transportation (WIT) Program has funded 322 timber bridge projects, 234 of which are complete. The WIT Program has also funded 93 special projects, 61 of which are now complete. Many of these special projects are focused on broadening the former National Timber Bridge Initiative into other wood-in-transportation applications.

In Fiscal Year 1996, the WIT Program developed guidelines for commercialization projects. The goal of these projects is to fully commercialize technology that has been successfully developed and demonstrated for transportation-related structures. WIT projects have assisted in improving the nation's transportation system and have revitalized local economies. In Fiscal Year 1998, the WIT Program focused primarily on proven technology developed during the previous nine years of the program.

Increasing interest in wood-in-transportation structures, combined with a growing demand for technical information, indicates there is a real desire for the services provided by the program. As WIT technology moves into the future, we will continue to provide reliable leadership and direction in the sustainable use of our nation's forest resources for transportation purposes well into the 21st century.



Michael T. Rains
Northeastern Area Director

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EXECUTIVE SUMMARY

A significant opportunity exists in the United States to improve local transportation networks and revitalize local economies by using wood for bridges and other transportation structures. Approximately 30 percent of the 589,000 highway bridges across the nation are in need of repair or replacement, consequently imposing a severe burden on the economy.

Modern timber bridge technology provides an opportunity to rebuild this crumbling infrastructure. Many bridges, particularly those on double-lane, rural roads, are ideally suited for replacement with wood. Improvements in wood treatment, engineered wood composite products, and bridge designs provide for the increased use of wood as a construction material to assist in the cost-effective rebuilding of our nation's infrastructure.

To address this opportunity, the United States Congress funded the Wood In Transportation Program, formerly known as the National Timber Bridge Initiative, beginning in Fiscal Year 1989. The purpose of this Status Report is to describe the WIT Program and its accomplishments to date.

PROGRAM DESCRIPTION

Mission Statement

To diversify local economies by:

- *Improving transportation networks which, in turn, improves community vitality.*
- *Expanding the range of markets for wood products.*
- *Creating service industries for wood-in-transportation structures.*
- *Commercializing modern timber bridge technology.*
- *Utilizing community resources such as local timber and local labor.*
- *Improving America's forests through stewardship.*

Vision and Goals

The WIT Program's vision and goals are being achieved through four distinct, yet interrelated components. These are:

- Wood In Transportation Demonstration Projects
- Research
- Technology Transfer and Information Management
- Rural Revitalization

Outlook

In the next year, the WIT Program will work toward the following :

- Continuing to commercialize existing technology that has been developed since Fiscal Year 1989.
- Continuing research efforts that will further refine the performance and cost competitiveness of transportation structures using locally-available timber resources.
- Increasing information and educational efforts:
 - Improving and maintaining the National Wood In Transportation Information Center's library.
 - Making technical information available to the public through the Internet.
- Broadening timber bridge technology into other areas of transportation-related uses such as rails-to-trails, docks and marine facilities, sign and light posts, portable timber bridges, culverts, sound barriers, retaining walls, and railings.
- Continuing to promote the WIT Program as an important tool in the stewardship of America's forests.

PROGRAM COMPONENTS

Wood In Transportation Demonstration Projects

Timber Bridges —

Demonstration timber bridges show people how wood and new technology provide alternatives to traditional bridge construction techniques and materials. Some bridges are constructed using local labor and local timber resources, thus stimulating the area's economy. Using local timber also improves the health of our forests by developing a use for low-value wood. Many of the demonstration timber bridges are cost-competitive with other bridge materials primarily because of:

- Lower costs for material and construction
- Lower maintenance costs
- Lower life-cycle costs

As of October 1998, 234 vehicular and pedestrian timber bridge projects have been completed with WIT assistance. The program has funded a variety of timber bridge designs. One design consists of placing timbers on edge and holding them together by running threaded steel rods from one side to the other. Another type of design utilizes glue-joined lumber. Demonstration timber bridges have been constructed of hardwoods, softwoods, and a combination of wood and other materials.

Some potential advantages of wooden bridges are:

Wood Type: *Most tree species; often locally available*
Amount: *15,000 board feet [32 ft.(W) by 30 ft.(L) span]*
Maintenance: *Low; no painting of treated timbers*
Chemical Effects: *De-icing agents do not affect wood*
Life Expectancy: *30-50 years*
Construction Time: *Minimal*
Use: *All road systems and traffic loads*
Treatments: *Basic wood preservation treatments approved by the Environmental Protection Agency*

Table 1
Total Funding for Wood In Transportation Demonstration Projects
Fiscal Years 1989 through 1998*

Goal	Combined 1989-1992 Final	1993 Final	1994 Final	1995 Final	1996 Final	1997 Final	1998 Final	Total
..... Dollars in thousands								
Vehicular Bridge Projects	(169)	(34)	(28)	(22)	(12)	(1)	(0)	(266)
Federal Contribution	\$8,081	\$1,088	\$827	\$683	\$496	\$50	\$0	\$11,225
Coop. Contribution	15,457	2,329	2,051	1,051	739	244	0	21,871
Subtotal	23,538	3,417	2,878	1,734	1,235	294	0	33,096
Pedestrian Bridge Projects	(13)	(13)	(8)	(9)	(7)	(5)	(1)	(56)
Federal Contribution	130	176	73	90	64	43	22	598
Coop. Contribution	206	719	423	263	122	135	22	1,890
Subtotal	336	895	496	353	186	178	44	2,488
Special Projects	(17)	(14)	(18)	(17)	(13)	(8)	(6)	(93)
Federal Contribution	345	199	380	343	393	193	106	1,959
Coop. Contribution	374	811	524	1,210	437	246	131	3,733
Subtotal	719	1,010	904	1,553	830	439	237	5,692
Commercialization Projects	—	—	—	—	(1)	(2)	(4)	(7)
Federal Contribution	—	—	—	—	105	90	417	612
Coop. Contribution	—	—	—	—	342	158	593	1,093
Subtotal	—	—	—	—	447	248	1,010	1,705
Total	\$24,593	\$5,322	\$4,278	\$3,640	\$2,698	\$1,159	\$1,291	\$42,981

* Figures in this table for total Forest Service funding of demonstration projects is greater than the totals shown for demonstration projects in Table 7 on Page 18. The difference between this table and Table 7 is additional projects that were funded from returned grant dollars.

The following table illustrates the total federal funding, by state, for demonstration timber bridge projects since the beginning of the WIT Program. The table does not include bridges on National Forest System lands, special projects, or commercialization projects.

Table 2
Total Federal Funding for
Demonstration Vehicular and Pedestrian Bridge Projects
Fiscal Years 1989 through 1998

State	FY 1989-97 Funding	FY 1989-97 Number of Projects	FY 1998 Funding	FY 1998 Number of Projects	Total Funding	Total No. Bridges to Result from all Projects*
Alabama	\$561,099	13	\$0	0	\$561,099	16
Alaska	268,835	9	0	0	268,835	9
Arizona	155,950	6	0	0	155,950	6
Arkansas	212,850	7	0	0	212,850	7
California	105,500	5	0	0	105,500	5
Colorado	190,600	6	0	0	190,600	6
Connecticut	73,500	3	0	0	73,500	3
Delaware	0	0	0	0	0	0
Dist. of Columbia	40,000	2	0	0	40,000	2
Florida	146,500	6	0	0	146,500	6
Georgia	297,590	12	0	0	297,590	12
Hawaii	0	0	0	0	0	0
Idaho	304,400	10	0	0	304,400	10
Illinois	186,500	6	0	0	186,500	6
Indiana	88,600	3	0	0	88,600	3
Iowa	165,700	6	0	0	165,700	6
Kansas	240,000	8	0	0	240,000	8
Kentucky	116,500	4	0	0	116,500	4
Louisiana	265,754	7	0	0	265,754	16
Maine	98,900	4	0	0	98,900	4
Maryland	304,250	9	0	0	304,250	10
Massachusetts	152,000	4	0	0	152,000	4
Michigan	600,875	19	0	0	600,875	20
Minnesota	149,000	3	0	0	149,000	3
Mississippi	300,873	11	0	0	300,873	11
Missouri	70,000	3	0	0	70,000	3
Montana	209,487	8	0	0	209,487	8

Table continued on following page

Table 2 (continued)
Total Federal Funding for
Demonstration Vehicular and Pedestrian Bridge Projects
Fiscal Years 1989 through 1998

State	FY 1989-97 Funding	FY 1989-97 Number of Projects	FY 1998 Funding	FY 1998 Number of Projects	Total Funding	Total No. Bridges to Result from all Projects*
Nebraska	168,627	4	0	0	168,627	4
Nevada	30,000	1	0	0	30,000	1
New Hampshire	72,000	3	0	0	72,000	3
New Jersey	90,550	3	0	0	90,550	3
New Mexico	135,995	5	0	0	135,995	5
New York	504,281	18	0	0	504,281	18
North Carolina	25,000	1	0	0	25,000	1
North Dakota	141,700	5	0	0	141,700	5
Ohio	287,231	9	0	0	287,231	9
Oklahoma	240,862	9	0	0	240,862	9
Oregon	238,000	6	0	0	238,000	6
Pennsylvania	499,900	13	0	0	499,900	30
Rhode Island	68,555	4	0	0	68,555	4
South Carolina	61,000	3	0	0	61,000	3
South Dakota	119,100	4	0	0	119,100	5
Tennessee	170,160	8	0	0	170,160	8
Texas	39,400	2	0	0	39,400	2
Utah	87,270	5	0	0	87,270	5
Vermont	55,800	2	0	0	55,800	2
Virginia	130,000	6	0	0	130,000	6
Washington	157,500	6	0	0	157,500	6
West Virginia	2,860,686	21	21,600	1	2,892,286	65
Wisconsin	156,687	4	0	0	156,687	4
Wyoming	154,110	5	0	0	154,110	5
Total	\$11,799,677	321	\$21,600	1	\$11,813,927	397

* The total number of bridges that will result upon completion of all funded projects (FY 1989-98).

Special Projects —

Special projects demonstrate new technologies or methods for reducing transportation system costs. They also study markets or perceptions related to the use of timber in transportation structures. Special projects enable cooperators to initiate endeavors or implement strategies that will stimulate local, regional, or national economies. They provide an avenue for the WIT Program to broaden into other wood-in-transportation applications, such as retaining walls, portable bridges for temporary access, and railroad infrastructure. Since 1989, 93 special projects have been funded. Copies of summaries of special projects funded from 1989 to 1998 are available from the National Wood In Transportation Information Center (contact information listed on Page 14).

Table 3
Total Federal Funding for Special Projects
Fiscal Years 1989 through 1998

State	FY 1989-97 Funding	FY 1989-97 Number of Projects	FY 1998 Funding	FY 1998 Number of Projects	Total Funding	Total No. Structures to Result from all Projects*
Alabama	\$18,400	1	\$0	0	\$18,400	1
Alaska	49,910	1	0	0	49,910	1
Arizona	0	0	0	0	0	0
Arkansas	0	0	0	0	0	0
California	0	0	0	0	0	0
Colorado	20,000	1	0	0	20,000	0
Connecticut	0	0	0	0	0	0
Delaware	0	0	0	0	0	0
Dist. of Columbia	10,000	1	0	0	10,000	0
Florida	0	0	0	0	0	0
Georgia	20,000	1	0	0	20,000	7
Hawaii	0	0	0	0	0	0
Idaho	0	0	0	0	0	0
Illinois	0	0	0	0	0	0
Indiana	11,000	1	0	0	11,000	1
Iowa	67,500	3	0	0	67,500	1

Table continued on following page

Table 3 (continued)
Total Federal Funding for Special Projects
Fiscal Years 1989 through 1998

State	FY 1989-97 Funding	FY 1989-97 Number of Projects	FY 1998 Funding	FY 1998 Number of Projects	Total Funding	Total No. Structures to Result from all Projects*
Kansas	8,200	2	0	0	8,200	2
Kentucky	0	0	0	0	0	0
Louisiana	2,000	1	0	0	2,000	0
Maine	10,000	1	0	0	10,000	1
Maryland	11,500	1	0	0	11,500	1
Massachusetts	50,000	2	0	0	50,000	0
Michigan	19,300	2	0	0	19,300	0
Minnesota	0	0	0	0	0	0
Mississippi	128,000	12	12,000	1	140,000	0
Missouri	0	0	0	0	0	0
Montana	0	0	0	0	0	0
Nebraska	0	0	18,776	1	18,776	0
Nevada	0	0	0	0	0	0
New Hampshire	12,500	1	0	0	12,500	0
New Jersey	30,000	1	0	0	30,000	0
New Mexico	18,886	1	0	0	18,886	0
New York	137,300	5	20,000	1	157,300	3
North Carolina	0	0	0	0	0	0
North Dakota	0	0	0	0	0	0
Ohio	5,000	1	0	0	5,000	0
Oklahoma	0	0	0	0	0	0
Oregon	20,000	1	0	0	20,000	0
Pennsylvania	213,720	9	30,000	2	243,720	4
Rhode Island	0	0	0	0	0	0
South Carolina	0	0	0	0	0	0
South Dakota	0	0	0	0	0	0
Tennessee	0	0	0	0	0	0
Texas	0	0	0	0	0	0
Utah	0	0	0	0	0	0
Vermont	30,000	1	0	0	30,000	1
Virginia	148,131	8	0	0	148,131	3
Washington	30,000	2	0	0	30,000	0
West Virginia	717,091	23	25,000	1	742,091	1
Wisconsin	65,000	4	0	0	65,000	2
Wyoming	0	0	0	0	0	0
Total	\$1,853,438	87	\$105,776	6	\$1,959,214	29

* The total number of structures that will result upon completion of all funded projects (FY 1989-98).

Commercialization Projects —

In Fiscal Year 1998, the Wood In Transportation demonstration program focused funds on commercialization projects. The WIT Program began funding commercialization projects in 1996, and since then has funded projects in Alaska, Florida, Iowa, Montana, Ohio, Pennsylvania, and West Virginia.

A commercialization project is a cooperative venture in which the Forest Service shares the cost with partners willing to share the benefits and commercial opportunities with others. These partners work closely with USDA Forest Service personnel to ensure that structurally adequate and economical wooden structures are built in a way that maintains strict quality control and provides a means to monitor the performance of the structures.

The intended outcome of these projects is to develop structures that showcase wood-in-transportation technology and provide useful design and cost information for potential users throughout the nation. These projects build upon past knowledge gained from research and other demonstration projects. An example of a commercialization project is the construction of several bridges using the same basic design and local timber resources within a single- or multi-county area.

In Fiscal Year 1998, the USDA Forest Service awarded \$417,250 for four commercialization projects. One of these projects will result in four cost-effective, southern pine, stress-laminated timber bridges in Ohio. Another project will produce ten portable timber bridges that will be used for timber harvesting operations in West Virginia. The third project will erect four white spruce, stress-laminated timber bridges in Alaska. The fourth project will construct five glulam cottonwood decks over steel stringers in Iowa.

The table that follows lists the commercialization projects funded to date.

Table 4
Commercialization Wood In Transportation Projects
Fiscal Years 1996 through 1998

State	County	Federal Contribution	Cooperator Contribution	Fiscal Year	Planned Project Outcomes
Alaska	Mat-Su	\$107,000	\$118,000	1998	4 vehicular timber bridges
Florida	Bay	50,000	93,606	1997	1 vehicular timber bridge
Iowa	Ida	124,500	124,500	1998	5 vehicular timber bridges
Montana	Yellowstone	100,000	341,600	1996	3 vehicular timber bridges
Ohio	Richland	100,000	348,205	1998	4 vehicular timber bridges
Pennsylvania	Centre	40,000	65,650	1997	1 pedestrian timber bridge and standard designs publication
West Virginia	Monongalia	\$85,750	\$102,125	1998	10 portable timber bridges

Research

The use of wood as a construction material is being researched to optimize the balance between existing and constantly developing technology. The goal is to ensure that current and future design and construction methods receive the optimum benefit of newly developed technology. Major research activities are based on the six-year needs assessment initiated in 1992 by the USDA Forest Service's Forest Products Laboratory (FPL) at Madison, Wisconsin, and the Federal Highway Administration (FHWA). The study identified more than 200 research needs. Some of the more important needs were:

- To develop crash-tested bridge rails for longitudinal and transverse timber decks.
- To prepare guidelines and standard design details for designing modern timber bridges for minimum maintenance and long life.
- To develop economical, easy-to-use equipment and methods to conduct nondestructive testing of in-place timber bridge components, including piles.
- To evaluate new wood preservatives.

The research effort is cooperative in nature. At the core of the program are the FPL and the FHWA. Their collaborators include West Virginia University, the University of Nebraska, Iowa State University, Oregon State University, Auburn University, and other universities throughout the country.

The WIT Program is providing an opportunity for universities to design and develop new timber bridge systems. This research effort has prompted provisional adoption of stress-deck design criteria by the American Association of State Highway and Transportation Officials (AASHTO). Adoption of these design criteria has provided uniform standards for slab deck designs across the country.

Monitoring the performance of selected demonstration bridges and bridges on National Forest System land is necessary to develop and further refine economical, structurally sound designs that will ultimately meet the approval of AASHTO. Monitoring activities typically include a two-year assessment of wood moisture content and bar stress levels, one or more load tests, and intense visual inspection. Bridge monitoring is currently in progress on many demonstration bridge projects throughout the country to assess field performance of various designs. All of these activities provide information that helps improve design procedures, fabrication, construction, and erection methodologies.

Technology Transfer and Information Management

It is essential that the WIT Program be accessible to the public, including highway officials, bridge engineers, and community decision makers. For this program to be successful, information about uses of wood-in-transportation applications must be transferred and distributed to others. The National Wood In Transportation Information Center, located in Morgantown, West Virginia, helps administer the WIT Program. The center also identifies emerging technologies and stores, retrieves, and disseminates information to meet the needs of managers, planners, designers, builders, engineers, and others.

Besides overall program management, there are several primary activities occurring at the center. Some of these are:

- Administration of the demonstration grant program.
- Facilitation of technology transfer.
- Technical assistance.
- Coordination of conferences, workshops, and seminars.
- Information distribution.
- Coordination with field coordinators.

Responding to the need expressed by bridge engineers and government decision makers for up-to-date information on modern timber bridge construction, the USDA Forest Service prepared and published a design and construction manual, which can be acquired from the National Wood In Transportation Information Center by calling (304) 285-1591. Other publications offered by the center include *Crossings*, the quarterly newsletter of the WIT Program; *Timber Bridge Superstructure Cost Report*; and *Contacts Report on Demonstration Project Cooperators*.

Many publications developed by the Forest Products Laboratory, such as *Standard Plans for Southern Pine Bridges*, *Plans for Crash-Tested Bridge Railings for Longitudinal Wood Decks*, and a variety of monitoring reports are also available. In Fiscal Year 1998, about 50,000 pieces of wood-in-transportation information were distributed by the National Wood In Transportation Information Center.

As part of the technology transfer effort, the Information Center has established a website at <http://www.fs.fed.us/na/wit>. This site contains valuable information about the Forest Service's WIT Program, available publications, grant opportunities, WIT events, WIT links, and WIT Coordinators. Some specifics that you can find at the website are:

WIT Publications — This section of the website contains more than 140 individual titles divided into 13 categories.

WIT Grants and Demonstration Projects — This page on the website offers details about the cost-share program. In the future, information on demonstration projects will be available.

In addition, the Forest Products Laboratory has a website that includes electronic versions of many of FPL's publications on wood-in-transportation technology. The website address is <http://www.fpl.fs.fed.us/wit/>.

Rural Revitalization

The WIT Program aims to stabilize and revitalize the economic well-being of rural economies through service industry development and market expansion. It strives to provide greater economic diversity and stability for rural communities. As part of the overall effort of the USDA Forest Service State and Private Forestry's Economic Action Program, WIT provides a tangible, efficient example of how local economies can be expanded and revitalized.

Typical activities include:

- Emphasizing historically underutilized wood in the construction of wood-in-transportation structures.
- Creating local jobs and long-term employment prospects.
- Creating additional service industries by utilizing community resources such as local timber and local labor.

WIT projects link local, regional, and national markets. They support business expansion while allowing commuters, travelers, producers, and shoppers to reach their destinations. Enhanced economic activity serves the public sector by generating additional revenue through sales, property, and income taxes. Wood-in-transportation structures can be a base for sustained economic growth by employing local labor to fabricate and erect bridges and related projects made from local lumber.

Accomplishments of the WIT Program

Following are some of the accomplishments of the Wood In Transportation Program:

- Two-hundred-five vehicular and twenty-nine pedestrian timber bridge projects completed. Many demonstrate the benefits of wood as a structural material.
- Sixty-one special projects completed. Many demonstrate the use of timber in other wood-in-transportation applications such as retaining walls, portable bridges for temporary access, and marine structures.
- One commercialization project completed.
- Increased awareness among highway officials and bridge engineers about modern timber bridges.
- Developed informative, easy-to-understand timber bridge manual and related technical information.
- Comprehensive monitoring program implemented to determine the structural adequacy of new designs.
- Developed designs using underutilized timber.
- Certification of hardwood species for structural uses.
- Approximately 50,000 pieces of information distributed by the National Wood In Transportation Information Center in Fiscal Year 1998.
 - Creation of a WIT website.
 - Comprehensive library that includes over 140 publications.
- *Crossings* newsletter — 5,800 distributed quarterly.
- Focused effort on commercializing developed technology.

The two tables that follow reflect accomplishments of the Wood In Transportation Program.

Table 5
Wood In Transportation Projects Funded
FY 1998

Type of Project	Number	Federal Contribution	Cooperative Contribution
Vehicular/Pedestrian Bridges	1	\$21,600	\$21,600
Special Projects	6	105,776	130,706
Commercialization Projects	4	417,250	592,830
Other	1	45,000	0
Total	12	\$589,626	\$745,136

Table 6
Completed Wood In Transportation Projects
FY 1998

Region	Timber Bridges		Special Projects	Commercial-ization Projects	Total
	Vehicular	Pedestrian			
Northeastern	97	10	35	0	142
Southern	50	10	17	0	77
Western	58	9	9	1	77
Total	205	29	61	1	296

Wood In Transportation Conferences

Wood In Transportation information and technology is made available at formal conferences. An estimated 14,000 state and county officials, engineers, and involved citizens have participated in these forums since the program began. To date, more than 50 conferences and workshops have been held within the guidelines of the WIT Program, and more are scheduled.

BUDGET SUMMARY

The following table provides the funding history of the WIT Program by major program components.

Table 7
Funding History of the
Wood In Transportation Program
Fiscal Years 1989 through 1999

Goal	Combined 1989-1993 Final	1994 Final	1995 Final	1996 Final	1997 Final	1998 Final	1999 Final
.....Dollars in thousands							
Demonstra- tion Projects	\$8,997	\$1,009	\$1,020	\$604	\$447	\$456	\$450
Research	4,356	1,093	1,100	770	650	650	650
Technology Transfer	3,523	732	671	596	753	744	750
Total	\$16,876	\$2,834	\$2,791	\$1,970	\$1,850	\$1,850	\$1,850

Administration of the WIT Program is assigned to the North-eastern Area, State and Private Forestry. Field locations are Morgantown, West Virginia (National Wood In Transportation Information Center), and selected Forest Service Regional Offices (Program Coordinators). The research component of the program is administered at the Forest Products Laboratory in Madison, Wisconsin.

CONTACTS

Forest Service technical advisors for the Wood In Transportation Program are located throughout the country to help implement the program. These key contacts are responsible for:

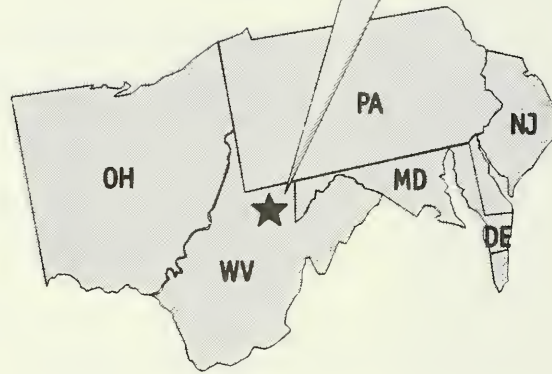
- Coordinating the application process for WIT demonstration projects.
- Coordinating local conferences, workshops, and seminars.
- Monitoring the status of projects within their regions, providing technical assistance, and disseminating information to potential users.
- Providing information to the National Wood In Transportation Information Center.

The following illustrations list the Forest Service Wood In Transportation Coordinators.

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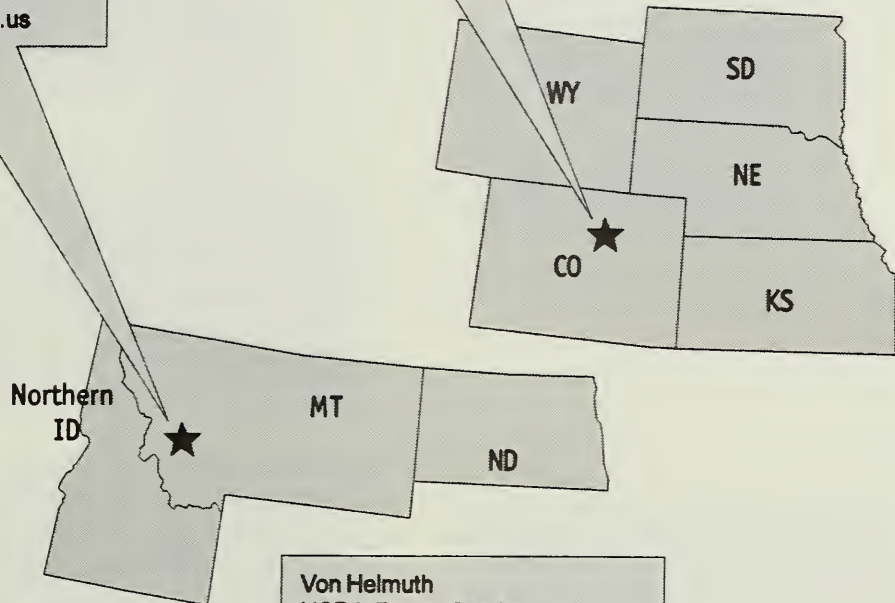


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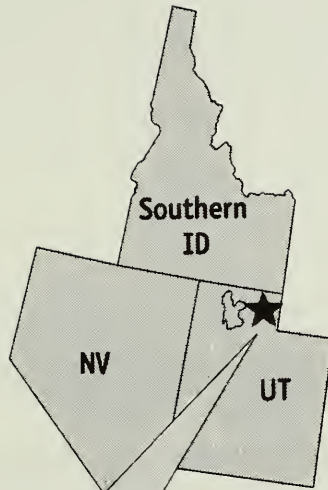
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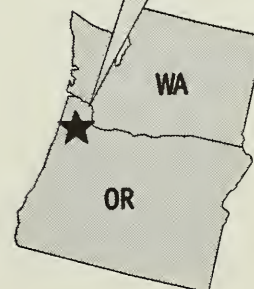


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